

JET NOISE AND TURBULENCE

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H. S. Ribner
Principal Investigator

(A) Sound Refraction by a Jet Temperature Field

Last time we reported on results obtained with a liquid nitrogen boiler which yielded a nitrogen jet at -180°C . The sound rays from a pure tone point source in this very cold jet were found to be bent or refracted inward--a focusing effect--to yield a high intensity sound beam in a narrow cone about the jet axis. One paper on this novel effect has since been published by ourselves (Ref. 1). An earlier paper treating ambient and hot jets (Ref. 2) has been selected for republication as a NASA report, we are informed. Reference 2 was under joint support by NASA, AFOSR, and the National Research Council of Canada (cf. also earlier versions Refs. 3 and 4).

A paper (Ref. 5) covering the cold jet and later work in more detail than Ref. 1 is in an advanced state of preparation. A particular feature is the comparison, for ambient temperature jets, of the directional pattern of jet noise with that from our artificial point source placed in the jet. We have made a strong point of the similarity of the two kinds of pattern, arguing that the close match implies that refraction or bending of sound rays plays an important role in jet noise. A paper intended for the open literature combining and condensing references 2 and 3 is likewise in preparation.

(B) Space-Time Correlations on a Plate Impinged on by a Turbulent Jet

There has been no progress beyond the rough draft report reported last year. We plan to finalize this report by November 1.

REFERENCES

Publications supported under this grant:

1. Grande, E. - "Refraction of Injected Sound by a Very Cold Nitrogen Jet", J. Acoust. Soc. Amer., 38, pp. 1063 - 1064 (1965).
2. Atvars, J., Schubert, L.K., Grande, E. and Ribner, H.S. - "Refraction of Sound by Jet Flow and Jet Temperature", Univ. of Toronto, Inst. for Aerospace Studies, UTIAS TN No. 109 (May, 1965).
3. Atvars, J., Schubert, L.K. and Ribner, H.S. - "Refraction of Sound from a Point Source Placed in an Air Jet", J. Acoust. Soc. Amer., 37, pp. 168 - 170 (1965).
4. Atvars, J., Schubert, L.K. and Ribner, H.S. - "Refraction of Sound from a Point Source Placed in an Air Jet", AIAA Paper No. 65-82, AIAA 2nd Aerospace Sciences Meeting, 25-27 Jan. 1965.
5. Grande, E. - "Refraction of Sound by Jet Flow and Jet Temperature II", Univ. of Toronto, Inst. for Aerospace Studies, UTIAS TN No. 110 (to be published).